

**ARS Grape and Wine Industry Workshop**  
**Monday, July 11, 2005**  
**Genetics, Breeding, and Germplasm Discussion Synopsis**

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Realization of the benefits of breeding, genetics, and germplasm research comes in the form of enhanced grape and grape product quality, effected through improved varieties and clones and novel identification, diagnostic, and management practices. The application of breeding, genetics, and germplasm to the advancement of grape growing, packing, and processing must be integrated with research in plant physiology, plant pathology, entomology, cultural practices, nutrition, product quality, marketing, and consumer acceptance. Improved varieties and clones must be thoroughly evaluated, with consideration given to the quality of the fruit and processed products as well as to interactions with cultural practices and vineyard management. Close cooperation and frequent dialogue between ARS researchers and the grape and grape products industry is essential for continuing successful research.

**Breeding and Evaluation**

Improved grape varieties are a primary target of grape breeding and genetics research. Enhanced pest and disease resistance, environmental adaptation, and improved commercial attributes are sought in improved varieties. Breeding, clonal selection, the evaluation of heritage materials, the introduction of recognized varieties from other areas, and other approaches are recognized in grape variety improvement.

Varieties with pest and disease resistance provide growers with additional options in pest and disease management, reduce chemical spread to the environment, and present consumers with products with fewer residues. Disease and pest resistance research should focus on those pests and diseases with the greatest impact to growers, packers, processors, and consumers. Identification of priority pests and diseases should include economic impact, efficacy and availability of current management practices, geographical distribution, and trends in pest and disease spread and control. The top priority pests and diseases identified as targets for breeding, genetics, and evaluation research are powdery mildew, wood canker diseases, bunch rots, nematodes, bacterial diseases (especially Pierce's disease and crown gall), and post-harvest diseases of table and raisin grapes.

Environmental adaptation is a critical aspect of varietal suitability. Cold hardiness is recognized as the environmental adaptation with the broadest geographic impact in the United States. Cold limits grape cultivation more than any other environmental condition; cultural practices to manage cold damage at a particular location are expensive and often not very effective. Improved varieties with enhanced cold hardiness would open new regions to grape cultivation and increase the quality and stability of yield in established viticultural areas. Desert adaptation, which includes tolerance of low chilling hours, particularly is important in table grape production. Currently chemicals are

applied to promote even bud break in desert production regions; there is an opportunity for the introduction of grape varieties that emulate the specialized varieties of other temperate fruit crops (peach, apple, plum) for low chill environments. Evaluation of improved varieties should consider adaptation to specific regions, as some varieties will be more suitable for cultivation in particular areas. Breeders and viticulturists should provide for evaluation of varieties and selections in multiple environments and recognize that improved varieties may be important only in specific environments and regions. When evaluating varieties and selections, special consideration should be given to the stability of quality attributes such as flavor, aroma, texture, and color. These attributes are influenced by the environment and their consistency from region to region impacts the utility of a variety and its attendant cultural practices.

Improving the commercial attributes of grape varieties includes both product quality and horticultural characteristics. Attributes such as color, flavor, mouthfeel, shape, nutritional and health aspects, and shelf-life and processing suitability are key determinants of the quality, consumer acceptance, and marketability of grapes and grape products. The impact and importance of key quality attributes must have a major role in grape improvement and evaluation. Improved horticultural characteristics should reflect current cultural practices and future management trends. Suitability for mechanical management practices and reduced vineyard handwork is important; for example, early ripening and natural (without cane cutting) dry on the vine raisin grape varieties are increasingly significant in raisin production. Appropriate vigor and cluster and canopy architecture vary with production system and environment and must be considered in improvement programs.

### **Clean Grapevine Material**

The great diversity of consumer grape products, including beverages, fresh fruit, dried fruit, sweeteners, food colors, and dietary supplements, accentuates the importance of genetic diversity to the grape growing, packing, and processing industry. To support the diverse and expanding uses of grapes, exploration of genetic diversity from all sources is encouraged. Many grape varieties of recognized merit grown outside the United States are not available domestically. Streamlining the identification, importation, and release into commerce of valuable grapevine materials is a top priority. This is particularly targeted at varieties from overseas, but the same principles apply to selections from domestic breeding and improvement programs. Importation of grape varieties currently is accomplished through university research facilities; the flow of varieties into the United States is hampered by the reduction in resources available to the host universities. Grape variety and germplasm collections should seek to provide quality planting and propagation material to growers, nurseries, researchers, and other users.

A network to provide information about varieties and their characteristics should be developed. This network would provide information about varieties and their characteristics, quality attributes, adaptation, origin, disease status, and availability. The network should be easy for users from diverse backgrounds to access and use. Several smaller networks are in place that accomplish portions of the goals for the proposed

system, but expansion and coordination is needed to meet the needs of the grape industry. A robust and effective grape variety information network will facilitate the evaluation and adoption of contemporary and novel grape varieties and selections through the exchange of accurate and timely information.

### **Improving Partnership**

Excellent communication and cooperation between the public research community and the grape and grape products industry is essential for the success of breeding, genetics, and germplasm research. Frequent and ongoing dialogue with growers, packers, and processors will help ensure the relevance, applicability, and adoption of scientific research. Interaction and exchange between the public research community and industry should take place at formal scientific meetings, field days, site visits, and many other forums. The technology transfer aspects of public research should be considered throughout the life of a project, especially the transfer of information and plant material to growers, packers, and processors. Transparency in intellectual property rights and obligations is sought. Greater coordination among researchers will both reduce redundancy and allow researchers to address larger and more complicated problems, resulting in accelerated timelines and reduced costs.

### **Enabling Technologies**

Grape improvement through breeding and evaluation is a long term endeavor. Commitment to the development and implementation of enabling technologies will facilitate progress in viticulture and grape improvement. In particular the integration of genetic tools and information for plant improvement and evaluation is essential for continued progress. Molecular markers associated with characters of commercial importance, for example, improve the efficiency of plant breeding, and their application in grape improvement should be facilitated. Genetic tools and information may be germplasm, genetic stocks, model grapevine systems, DNA sequence, techniques, or other forms.

The industry and research communities would benefit from organizations that provide identification and diagnostic services. Specialized services will provide researchers, growers, packers, and processors with access to the best technology for evaluating grape varieties and management practices without requiring them to become experts in a particular and specialized experimental technique. Coordination and sharing of commercially relevant characterization practices and information will increase the value and efficiency of evaluation.